Cruise Report

C-137

Scientific Activities Undertaken Aboard SSV *Corwith Cramer*

Miami – Little San Salvador – Jamaica – Honduras – Miami

February 7 — March 17, 1995

Sea Education Association — Woods Hole, Massachusetts

Table of Contents

Table of Tables

Table of Figures

Preface

This cruise report outlines the scientific research and academic program conducted on board SSV *Corwith Cramer* during C-137. It consists of a list of student projects completed during this cruise and data that are being incorporated into long-term studies of the SEA staff and associated researchers. The bulk of this report was written at sea. It is not intended to represent a final analysis or interpretation of data generated during C-137.

C-137 was a very successful cruise in every respect. Research operations provided a wealth of rich and varied information. The weather was perfect for sailing and sampling for most of the cruise, with only the last leg proving challenging to staff, students, sails, and ultimately, the engine. We were able to complete a great number of stations during C-137, many using the new Carousel sampling device and a-frame. This equipment is changing the way in which cruises and sampling programs can be planned and conducted by SEA, while retaining the educational value of traditional equipment such as the mechanical bathythermograph. The members of C-137 shared six weeks of hard work and fun at sea, developing from a group of strangers into a close community by the end of the voyage.

Captain Peg Brandon led the ship's complement with enthusiasm and dedication. Peg's interest in the research program and all aspects of the educational program at sea helped create an environment of cooperation and learning on *Cramer*. Chief mate Peter Bolster led his watches with extraordinary humor and ability. Second mate Nancy Bernstein led her watch with calm assurance and, as medical officer, patiently cared for all aboard *Cramer*. Third mate Grant MacDonald taught his watches a great deal about sailing, constantly encouraging his watches to perform to the best of their ability.

Engineer Bill Zuber made it look easy to maintain *Cramer's* complex pipes and machinery. Bill made contributions in all areas, whether helping with celestial navigation, repairing the stove or the shipek grab. Steward Theresa Tiedman made sure meals were always delicious and on time.

First assistant scientist Cliff Low ran the lab efficiently, carefully oversaw the maintenance of science equipment and contributed superb entertainment to swizzles. Second assistant scientist Leah Feinberg taught her watches the secrets of the safe deployment and recovery of sampling equipment and was an endless source of information on *Halobates*. Third assistant Ellie Linen directed her watch with skill and became a pro at Carousel deployment. The thorough professionalism and range of knowledge displayed by each of the assistant scientists added greatly to the success of C-137.

Throughout the cruise, the enthusiasm, excitement and hard work of twenty-five students made C-137 a success. All data were collected by students, the ship sailed by students, the food prepared by students, the ship maintained by students, and I hope, most of the fun enjoyed by students. It was their excitement with life at sea and enthusiasm for learning that made C-137 a rewarding trip for the entire staff. I would like to thank you, for the staff and myself, for all of your efforts that made C-137 such a memorable cruise.

Paul Joyce
Chief Scientist, C-137

Table 1: Ship's Complement for SSV *Corwith Cramer* Cruise C-137

Nautical Staff	
Peg Brandon	Captain
Peter Bolster	First Mate
Nancy Bernstein	Second Mate
Grant MacDonald	Third Mate
Bill Zuber	Engineer
Theresa Tiedman	Steward
Scientific Staff	
Paul Joyce	Chief Scientist
Cliff Low	First Assistant Scientist
Leah Feinberg	Second Assistant Scientist
Ellie Linen	Third Assistant Scientist
Students	
Jennifer Belfiore	Boston College
John Bowen	Rowan College
David Cohn	Hobart College
David Falla	Alfred University
Veronica Goldmacher	Colgate University
Dori Grotjan	Jacksonville University
Nicole Hade	William Smith College
Edward Hall	University of Massachusetts
Caroline Loop	Smith College
Sarah Lynch	University of Vermont
Colleen Matlen	Bates College
Teryn Moore	William Smith College
Lindsay O'Nell	Davidson College
Brian Page	University of Rhode Island
Ana Rodriguez Torres	Cornell University
Kristin Russell	Carleton College
Martin Russo	Lafayette College
Michaela Saliba	UC Santa Cruz
Jennifer Schenk	Bradford College
Jonathan Schultz	Colgate University
John Stafford	Carleton College
Eric Stoddard	Connecticut College
Bryan Trueworthy	Duke University
Sarah Weinstein	Bates College
Darcy Wheeles	Stanford University
Visitors	
Audrey Meyer	Sea Education Association
Ligia Sarmiento	Honduran Scientific Observer
David Jackson	SEA Trustee

C-137 Academic and Research Program

Academic Program

This cruise report is the written record of the scientific program conducted during the one hundred thirty seventh SEA Semester class, conducted aboard the SSV *Corwith Cramer* beginning and ending in Miami, Florida. The cruise track (Fig. 1) was designed to allow collection of physical, chemical, biological and geological data from several distinct oceanographic areas in the southern Sargasso and Caribbean Seas.

Research conducted during this cruise represents, in part, the ongoing work of individuals and agencies that have extended assistance to our students. Materials reported herein are the property of Sea Education Association. These materials should not be excerpted or cited without the written permission of the Chief Scientist or Sea Education Association.

A 24-hour watch was maintained in lab and on deck throughout the six-week duration of SSV *Corwith Cramer* Cruise C-137. These watches consisted of teams of three students and one assistant scientist in the laboratory, three students and one mate on deck. Students were instructed in the use of sampling gear and scientific procedures encompassing aspects of physical, geological, chemical and biological oceanography in the lab. Instruction was provided while performing oceanographic research for individual student projects, the work of SEA staff or long term cooperative programs. Routine meteorological and oceanographic observations were made. Students became sufficiently familiar with scientific and operational procedures of the vessel to direct all activities of the laboratory and deck without significant help from the scientific or nautical staff during the last two weeks of the voyage.

Formal instruction was provided daily in the form of lectures given by the science and nautical staffs. Lecture topics were designed to cover aspects of oceanography and marine science not readily acquired from practical experience.

C-137 consisted of two three-week courses in oceanography. The onboard experience was preceded by a rigorous six-week course in oceanography on shore. Successful completion of the entire SEA Semester program (seventeen academic credits) includes eleven credit hours in oceanography. Letter grades for each of the two shipboard courses were determined on the basis of on watch evaluation, project research, final written report and a laboratory practical examination.

Research Program

The research program was centered on the individual student research projects designed during the six-week shore component completed before C-137. Each project was designed to focus on a specific oceanographic question. Data and ideas were shared between individual projects through frequent formal and informal project discussions. Oceanographic studies fell into two categories: (1) Each student took to sea a well-planned project that was completed during the cruise. These projects were chosen and developed by the students on shore and completed at sea as independent research. A research paper and seminar were presented by each student at the end of the cruise to summarize their findings. (2) Several long-term projects are being conducted by SEA staff members and associated organizations. These include meteorological observations, geological studies, studies of the hydrography of the Caribbean Sea and analyses of the distribution and abundance of components of the biota.

Every oceanographic station was made for actual research; no sample was taken solely for demonstration. In this way, students were given the opportunity to learn by participation in actual research activities.

The variety and extent of information collected and analyzed during C-137 is only touched on in this cruise report. The appendices present a more complete idea of the rich texture of oceanographic data compiled during this cruise.

Table 2: Student Projects, C-137

- Caribbean surface circulation according to the geostrophic equation. *Eric Stoddard.*
- A study of the Antilles flow field northeast of Abaco Island using CTD and MBT data. *Shad Stafford.*
- Surface circulation off the coast of Roatan. *Lindsay O'Nell.*
- The limiting effects of Caribbean topography on the northward spreading of Antarctic Intermediate Water. *Dori Grotjan.*
- Analysis of deep water renewal into the Cayman Basin during February and March, 1995. *Sarah Weinstein.*
- A study of the mixing process within the Little San Salvador Lagoon. *Brian Page.*
- A comparison of the sedimentation of a Caribbean and Bahamian Bank — Little Bahama Bank and Formigas Bank. *Jonathan Schultz.*
- A study of planktonic foraminifera from the West Bay carbonate platform of Little San Salvador. *Veronica Goldmacher.*
- An oceanographic look at Formigas Bank. *Martin Russo.*
- Carbonate nodules in high versus low energy environments: how their growth is affected by various conditions and if such growth is a worthy indicator of the environment in which they live. *Kristin E. Russell.*
- Calcium carbonate sediment production on carbonate banks dependent on nutrient concentration: A comparison of the Albatross, Formigas, and Little Bahama Banks and Little San Salvador. *Nicole M. Hade.*
- The abundance and distribution of pelagic plastic in the Southern Sargasso and Caribbean Seas. *Michaela Saliba.*
- Concentration and distribution of pelagic tar in the Sargasso and Caribbean Seas. *Colleen Matlen.*
- The abundance of tar and plastic on the beaches of Little San Salvador, Jamaica and Roatan. *Teri Moore.*
- Locating the source of microtar particles in the Antilles Current. *Caroline M. Loop.*
- Chlorophyll *a* concentrations and the deep chlorophyll maximum in the Southern Sargasso and Caribbean Seas. *David Cohn.*
- A new method for photosynthetic evaluation of phytoplankton communities using the photosynthetic inhibitor DCMU with the Turner 112 fluorometer. *Edward Hall.*
- A study of the relative abundance of *Trichodesmium* and *Macrosetella gracillis* and the significance of this relationship. *Jennifer Belfiore.*
- Distribution and relative abundance of ciguatera causing dinoflagellates in the Sargasso Sea. *Jennifer Schenk.*
- The diel vertical migration of chaetognaths in the Caribbean and Southern Sargasso Seas. *Bryan Trueworthy.*

- The distribution of *Halobates micans* in the Sargasso and Caribbean Seas. *David Falla.*
- The distribution of myctophids related to biomass concentrations in the Caribbean Sea. *Darcy L. Wheeles.*
- Moon phase, zooplankton density and vertical migration in myctophids. *John Bowen.*
- Comparison and distribution of the coral reef communities in the leeward and windward sides of Little San Salvador. *Ana Lydia Rodriguez Torres.*
- The distribution and condition of coral in the Little San Salvador lagoon. *Sarah W. Lynch.*

Table 3: List of Oceanographic Lectures

Date	Speaker	Topic
Feb. 8	P. Joyce	Cruise Track and Research Plan
Feb. 9	Asst. Scientists	Neuston Tow Demonstration
Feb. 10	P. Joyce	Electronic Instrumentation: CTD, Carousel and PDR
Feb. 13	P. Joyce	Geology of Little San Salvador and the Bahamas
Feb. 16	A. Meyer	Drill Ship Operations
Feb. 17	Students	Project Discussions
Feb. 20	P. Joyce	Sea Turtles
Feb. 21	All	Lab Practical Exam
Feb. 27	P. Joyce	Writing a Scientific Paper, Creature Features
Feb. 28	All	Class Discussion: Ocean Dumping, Creature Features
Mar. 1	L. Feinberg	Sea birds, Creature Features
Mar. 2	E. Linen	Costa Rica Sea Turtle Research
Mar. 3	Students	Project Discussions
Mar. 8	P. Joyce	The Gulf Stream
Mar. 10	P. Joyce	El Niño, Transfer of Nonindigeneous Organisms in Ballast Water
Mar. 11	Students	Project Presentations
Mar. 12	Students	Project Presentations
Mar. 13	Students	Project Presentations
Mar. 15	P. Joyce	Caribbean and Cruise Wrap-up

Figure 1: Cruise track of SSV *Corwith Cramer* Cruise C-137

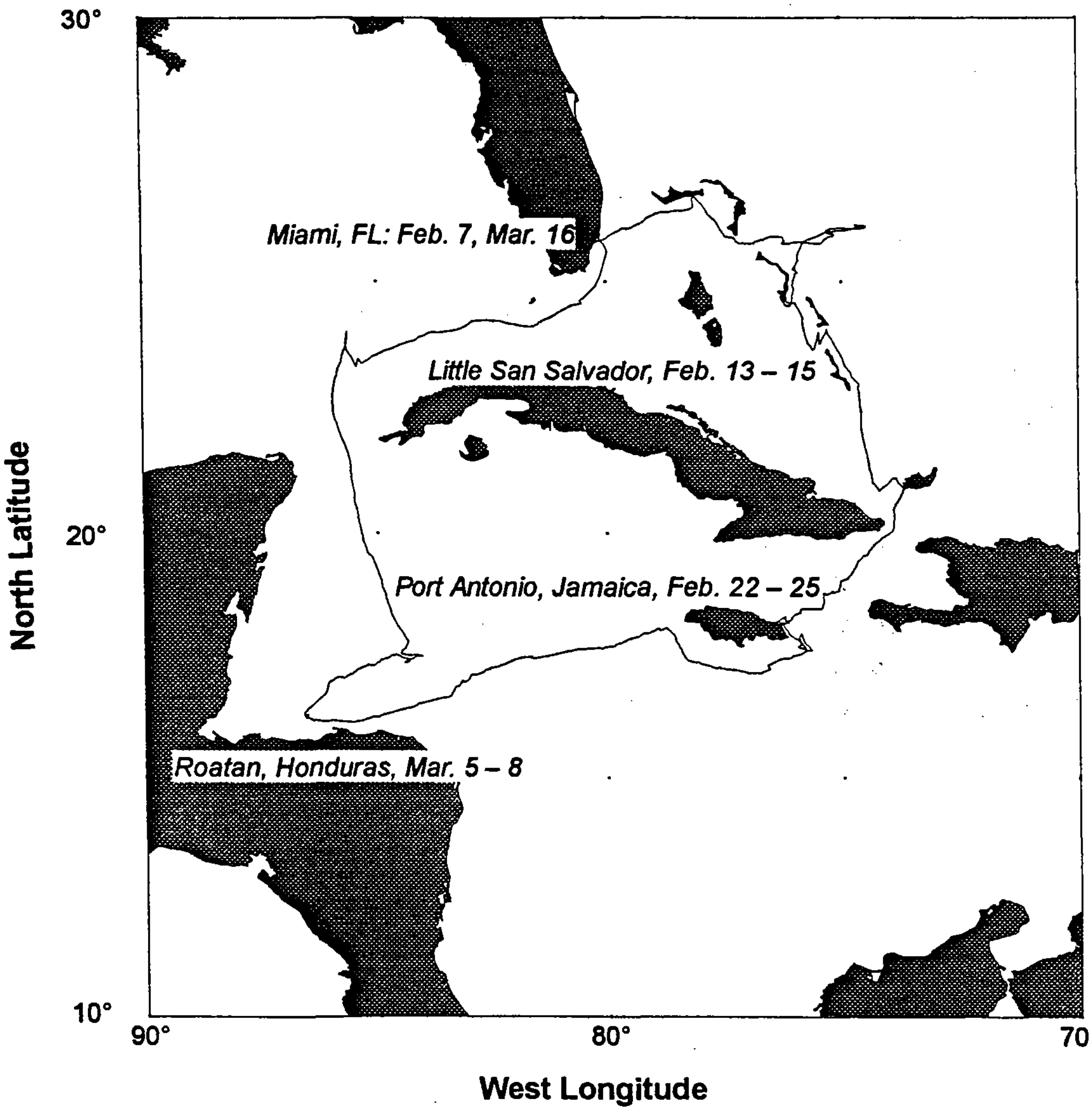


Table 4: Daily Positions, SSV *Corwith Cramer*, Cruise C-137

Date	Time hrs.	Log nm.	Latitude ° North	Longitude ° West
7/Feb/95	1200	0.0	Alongside	Miami, FL
8/Feb/95	0000	72.5	26°19	78°47
	1200	125.5	26°32	78°01
9/Feb/95	0000	187.7	25°46	77°14
	1200	231.7	25°52	76°26
10/Feb/95	0000	247.2	25°45	76°13
	1200	293.9	25°44	75°29
11/Feb/95	0000	327.0	25°56	75°16
	1200	378.1	26°04	74°31
12/Feb/95	0000	428.9	25°56	75°14
	1200	490.5	25°14	76°01
13/Feb/95	0000	521.7	24°54	76°02
	1200	587.0	24°35	75°58
14/Feb/95	0000	587.0	At Anchor	Little San Salvador, Bahamas
	1200	587.0	At Anchor	Little San Salvador, Bahamas
15/Feb/95	0000	605.2	At Anchor	Little San Salvador, Bahamas
	1200	605.2	At Anchor	Little San Salvador, Bahamas
16/Feb/95	0000	610.4	24°13	75°49
	1200	669.7	23°59	75°29
17/Feb/95	0000	729.8	23°48	75°11
	1200	803.3	22°56	74°40
18/Feb/95	0000	884.3	21°47	74°32
	1200	957.4	20°56	74°08
19/Feb/95	0000	1020.0	20°37	73°51
	1200	1088.3	19°48	74°20
20/Feb/95	0000	1138.0	19°10	74°51
	1200	1162.5	18°49	75°10
21/Feb/95	0000	1183.3	18°48	75°26
	1200	1215.0	18°29	75°47
22/Feb/95	0000	1232.6	18°19	76°06
	1200	1279.0	Alongside	Port Antonio, Jamaica
23/Feb/95	0000	1279.0	Alongside	Port Antonio, Jamaica
	1200	1279.0	Alongside	Port Antonio, Jamaica
24/Feb/95	0000	1279.0	Alongside	Port Antonio, Jamaica
	1200	1279.0	Alongside	Port Antonio, Jamaica

Date	Time hrs.	Log nm.	Latitude ° North	Longitude ° West
25/Feb/95	0000	1279.0	18°11	76°27
	1200	1282.7	18°11	76°09
26/Feb/95	0000	1331.8	17°38	75°48
	1200	1381.9	17°39	75°43
27/Feb/95	0000	1447.0	17°20	76°37
	1200	1517.3	17°18	77°38
28/Feb/95	0000	1575.5	17°41	78°27
	1200	1603.6	18°05	78°45
1/Mar/95	0000	1626.8	17°59	79°12
	1200	1675.2	17°43	79°57
2/Mar/95	0000	1714.4	17°40	80°38
	1200	1782.3	17°31	81°40
3/Mar/95	0000	1840.5	17°14	82°40
	1200	1889.1	16°56	83°14
4/Mar/95	0000	1951.1	16°32	84°09
	1200	2026.0	16°13	85°18
5/Mar/95	0000	2069.9	At Anchor	Coxen Hole, Roatan, Honduras
	1200	2102.0	At Anchor	Coxen Hole, Roatan, Honduras
6/Mar/95	0000	2102.0	At Anchor	Coxen Hole, Roatan, Honduras
	1200	2102.0	At Anchor	Coxen Hole, Roatan, Honduras
7/Mar/95	0000	2102.0	At Anchor	Coxen Hole, Roatan, Honduras
	1200	2102.0	At Anchor	Coxen Hole, Roatan, Honduras
8/Mar/95	0000	2102.0	At Anchor	Coxen Hole, Roatan, Honduras
	1200	2140.0	16°39	86°17
9/Mar/95	0000	2187.7	17°05	85°45
	1200	2250.8	17°24	84°59
10/Mar/95	0000	2302.2	17°28	84°25
	1200	2354.4	17°31	84°06
11/Mar/95	0000	2420.8	18°07	84°35
	1200	2501.0	19°20	85°03
12/Mar/95	0000	2567.0	20°19	85°26
	1200	2632.6	21°27	85°36
13/Mar/95	0000	2695.4	22°38	85°58
	1200	2765.0	23°55	85°39
14/Mar/95	0000	2830.4	23°19	85°27
	1200	2898.0	23°45	84°29

Date	Time hrs.	Log nm.	Latitude ° North	Longitude ° West
15/Mar/95	0000	2953.0	24°01	83°28
	1200	3006.3	24°14	82°28
16/Mar/95	0000	3070.5	24°17	81°15
	1200	3128.1	25°13	80°04
17/Mar/95	0000	3157.6	Alongside	Miami, FL

Cruise Narrative

The research program of C-137 studied the geological, physical, chemical and biological structure of the southern Sargasso and Caribbean Seas and peripheral land masses from February 7 to March 17, 1995. Sampling was conducted at regular intervals throughout the cruise in these areas.

A conductivity-temperature-depth (CTD) profile of the physical characteristics of the southern Sargasso and Caribbean Seas was begun soon after departure from Miami and continued throughout the cruise (Figures 8 – 13). Current velocity and flow direction of the waters of the Caribbean were determined using geostrophic calculations during a northeast to southwest transect of the central Caribbean between the Windward Passage and Roatan. The mean current between Jamaica and Roatan was found to be a northwest flow of 22 sverdrups. Mesoscale variability was identified in the region to the east of Jamaica (Eric Stoddard).

A mechanical bathythermograph and CTD profile was conducted in the area to the east of Abaco Island in the Bahamas to determine the nature of the current flow in this area. Data derived from two CTD and mechanical bathythermograph (MBT) transects show that cyclonic mesoscale eddy formations with transport of water to the northeast is the dominant circulation feature in this area (Shad Stafford).

The distribution of Antarctic Intermediate Water (AAIW), a mid-depth water mass, within the Caribbean was studied with a series of CTD casts. The series of ridges and rises in the Caribbean basin were found to act as physical barriers limiting the distribution of AAIW. The core temperature and salinity characteristics of this water mass became less distinct after passage over each successive ridge (Dori Grotjan).

Observations of concentrations of floating plastic and other debris during previous SEA cruises suggested the presence of a meso-scale circulation feature in the southwest Caribbean, off the coast of Honduras. CTD and MBT transects, and an analysis of the set and drift of the *Corwith Cramer,* were used to demonstrate the presence of a large eddy in this region. Surface flow was generally to the east in the eastern end of the transect, and shifted to the southwest at the western end of the transect (Lindsay O'Nell).

Caribbean deep water renewal through the Windward Passage was studied with a series of CTD casts. North Atlantic Deep Water (NADW), identified by a temperature of 4.8°C and salinity of 35.05‰ was found north of the Windward Passage, but not south of the Windward Passage in the Caribbean Sea. This suggests that NADW was being blocked from entering the Caribbean by the sill of the Windward Passage during the sampling period (Sarah Weinstein).

A physical survey of the Central Lagoon of the island of Little San Salvador was conducted to determine the extent of tidally driven mixing between the lagoon and offshore waters. Mixing was found to occur in the eastern end of the lagoon, closest to the channel which opens to offshore waters. A smaller degree of mixing was observed in the western and central areas of the lagoon (Brian Page).

A transect of six shipek grab samples was conducted in West Bay, Little San Salvador to determine the distribution of planktonic foraminifera in the sediments. Planktonic forams made up a larger component of samples collected from deeper waters than those collected at shallow depths. Input from terrestrial and shallow water benthic communities diluted the input of planktonic forams in the shallow water samples, but became less dominant as water depth and distance from shore increased (Veronica Goldmacher).

Sedimentation on two carbonate banks, Little Bahama Bank and Formigas Bank was compared. The calcareous algae *Halimeda* was dominant on both banks, particularly in the larger sediment size classes. The percentage of *Halimeda* decreased and planktonic foraminifera increased with increasing water depth. Compositional difference were noted between banks, with ooids, coral fragments and grapestones being most characteristic of the Little Bahama Bank, and forams and pteropods being more characteristic of Formigas Bank (Jonathan Schultz).

Moderate to high concentrations of nutrients may restrict the growth of carbonate banks. Two carbonate platforms in the Caribbean, Formigas and Albatross banks, were compared to the Bahamian platforms Little Bahama Bank and Little San Salvador. Surface water concentrations of phosphate were higher in the Caribbean than in the waters of the Bahamas. Sediments of the Bahamian banks were high in coral and coralline algae fragments, suggesting an active, rapidly growing system. Sediments of the Caribbean banks had little coral or coralline algae fragments and rhodoliths were present. The Caribbean banks were also deeper than the Bahamian banks. These data suggest that the Caribbean banks are growing more slowly than the Bahamian banks, and may be drowning as sea level rises (Nicole Hade).

Formigas Bank, the most northern bank on the Nicaraguan Rise, is located 43 miles north of Morant Point, Jamaica. A precision depth recorder (PDR) transect of this bank showed it to be bounded by a steep, productive windward margin with a shallow sloping leeward area of deposition. Samples recovered from the bank were dominated by coralline algae. These observations suggest that the position of Formigas Bank in an area of high wave and current activity controls its biological and morphological characteristics (Martin Russo).

Albatross Bank, a small, little studied carbonate platform in the Caribbean Sea, was sampled for rhodoliths. These carbonate nodules are thought to be good indicators of the physical environment in which they are found. Rhodoliths were found to form in all areas of Albatross Bank, instead of being transported across the bank from a small area of formation by some physical mechanism such as waves or storms. Rhodolith shape may be a better indicator of the wave and current environment to which they are exposed than their growth form (Kristin Russell).

The areal and depth distributions of chlorophyll *a*, an indicator of phytoplankton standing stock, was determined at surface sample stations and hydrocasts. The chlorophyll maximum was found at depths ranging from 50 to 100 meters, at the base of the mixed layer. Higher surface chlorophyll concentrations were found in the southern Sargasso Sea than in the Caribbean Sea. This unexpected result is likely due to sampling in the southern Sargasso being conducted near the islands of the Bahamas, resulting in increased nutrient input from terrestrial sources and therefore increased local levels of primary production (David Cohn).

While chlorophyll *a* has traditionally been used as a measure of primary production in the oceans, it provides little information about the rate at which the photosynthetic reaction takes place, and does not distinguish active cells from senescent cells. One technique which attempts to determine photosynthetic efficiency of active phytoplankton cells is the addition of the photosynthetic inhibitor 3-(3,4-dichlorophenyl)-1,11-dimethylurea (DCMU). This technique provides a measure of photosynthetic efficiency for a sample of living cells. A method was developed to use this technique with the Turner 112 fluorometer available aboard *Cramer*. Living phytoplankton cells were gently concentrated with a phytoplankton net to bring fluorescence within the sensitivity range of the instrument (Edward Hall).

The cyanobacteria *Trichodesmium* is an important primary producer and nitrogen fixer in oligotrophic systems such as the southern Sargasso and Caribbean Seas. The copepod *Macrosetella gracilis* increases the rate at which nitrogen fixed by the cyanobacteria is released into the surrounding waters. *Macrosetella gracilis*, both adults and nauplii, were found in association with *Trichodesmium*, but no direct relationship between number of copepods and cyanobacteria colonies was observed. *Trichodesmium* communities may not have developed sufficiently to support colonies of copepods because of the relatively rough sea conditions during most of the sampling period (Jennifer Belfiore).

Ciguatera, a disease caused by toxic dinoflagellates, is a threat to human health in many areas of the Caribbean and southwest North Atlantic. Although these dinoflagellates are most commonly found in association with benthic algas, recent studies suggest that pelagic *Sargassum* may also provide a substrate for *Gambierdiscus* and other toxic dinoflagellates. *Sargassum* collected at two locations in the southern Sargasso Sea was found to support small communities of the toxic dinoflagellates *Gambierdiscus toxicus*, *Ostreopsis lenticualris*, *Ostreopsis ovata* and *Prorocentrum*. These dinoflagellates were found in relatively low concentrations, possibly the result of a pattern of seasonality in their occurrence (Jennifer Schenk).

Chaetognaths, second in abundance to copepods among the larger zooplankton, are active diel vertical migrators. Chaetognaths were found in significantly greater numbers in nets towed at a depth of 100 m than those nets towed at 200 m during the night. Additionally, smaller chaetognaths were found in the shallow meter nets, suggesting that an ontogenetic vertical migration occurs in chaetognaths, with the older individuals inhabiting deeper depths (Bryan Trueworthy).

The abundance and life history of the only marine insect, *Halobates micans*, a water strider, were studied. The density of *Halobates* populations was not found to be significantly correlated to surface currents, surface water temperature, zooplankton density or sea state, but was well correlated to moon phase during night tows. A distinct and unusual pattern of carapace markings was noted on all nymph stages. These black marks on an orange carapace have not been reported by previous researchers (David Falla).

Myctophids, also known as lanternfish, are considered to be important indicators of water mass distribution. A total of 161 myctophids was collected during C-137 by neuston nets and the one and two-meter nets. Tropical - subtropical species comprised the majority of species collected (79.3%). Temperate and subtropical species were limited to the subtropical waters of the southern Sargasso Sea. Tropical species were most abundant in the Caribbean Sea (Darcy Wheeles).

The abundance of myctophids at the surface was strongly correlated to moon phase. Myctophids were found in the greatest abundance at the surface during the new moon and decreased as the moon waxed. The amount of cloud cover had no effect on the abundance of myctophids (John Bowen).

Coral distribution and abundance is related to a number of physical, biological and human factors. The distribution of coral was studied in the Central Lagoon of Little San Salvador in order to compare the present coral abundance to that recorded by previous SEA strident studies. *Oculina diffusa* had the greatest areal coverage, and was the species most commonly affected by coral bleaching. *Porites divaricata* was second in abundance, but little affected by bleaching. In general, the coral within the lagoon was observed to be healthy, with areal coverage increased from a student study conducted in 1980, although the amount of coral bleaching also increased (Sarah Lynch).

The coral communities of the windward and leeward sides of Little San Salvador were studied to observe the responses of the coral to variations in depth, rate of sedimentation, water clarity and wave action. A greater species diversity was observed on the windward side of the island, despite difficult working conditions. *Millepora* spp. and *Siderastera* spp. were the dominant corals on the leeward side. Wave energy is probably the most significant physical control of these coral reef communities, as temperature and salinity did not vary significantly between the two locations (Ana Lydia Rodriguez Torres).

Plastic debris has accumulated in the surface waters of the oceans at an increasing rates during the last 30 years. Little plastic debris was found in the southern Sargasso Sea, an area on the periphery of the north Atlantic central gyre. High concentrations of plastic were found in the northern Caribbean. This concentration is likely the result of meso-scale circulation features in this region acting to concentrate tar. Again, little floating plastic was found in the southern Caribbean, due to the flow-through nature of the Caribbean Current producing low residence times for this water mass, and therefore, materials floating at the surface (Michaela Saliba).

Conversely, higher concentrations of floating tar were observed in the southern Sargasso than in the Caribbean Sea. This is probably due to the higher volume of tanker traffic in the southern Sargasso. However, tar was found in lower densities than has been observed by SEA students previously, a trend which has now continued for eight years (Colleen Matlen).

Tar and plastic are often removed from surface waters to adjacent beaches. The abundance of tar and plastic were studied on the beaches and intertidal shorelines of Little San Salvador, Jamaica and Roatan. The concentration of these pollutants varied with location on the island, and was strongly influenced by the distance of the beach under study to local population centers. Plastic and tar debris on the beaches of Little San Salvador and Roatan probably came from sources external to the island, while the debris that accumulated on the Jamaican beach studied was most likely from a local source (Teri Moore).

Floating tar not removed to beaches weathers into smaller particles and, over time, sinks into the water column. An attempt was made to determine the geographic source of the tar particles based on the depth at which the particles were found and their calculated settling rate. However, the resulting settling times were improbably large (greater than 600 years), suggesting that some other mechanism acts to increase the rate at which tar particles are transported into the deep ocean (Caroline Loop).

Appendices

Figure 2: Oceanographic Station Locations, C-137

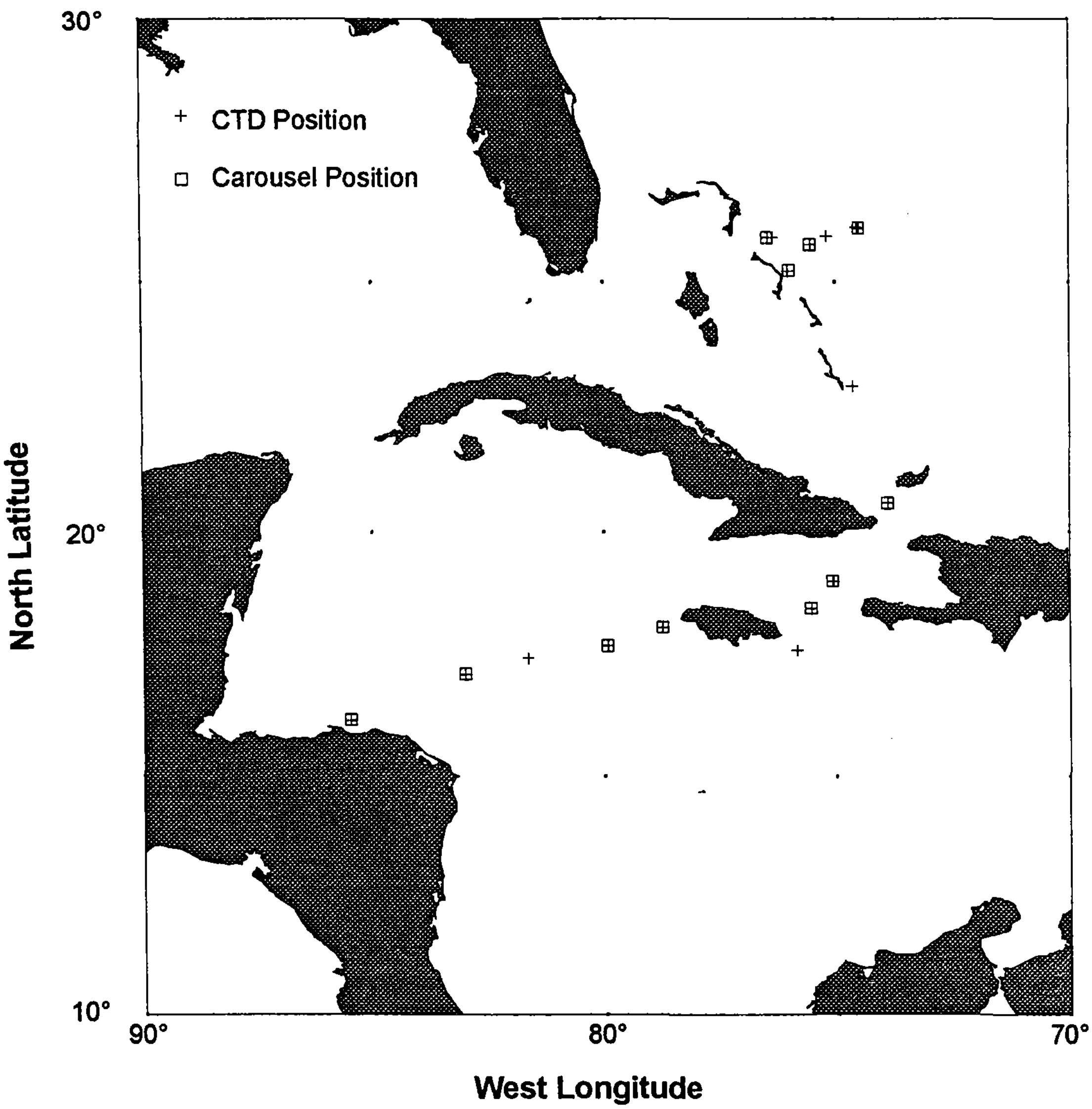


Figure 3: Net Tow Station Locations, C-137

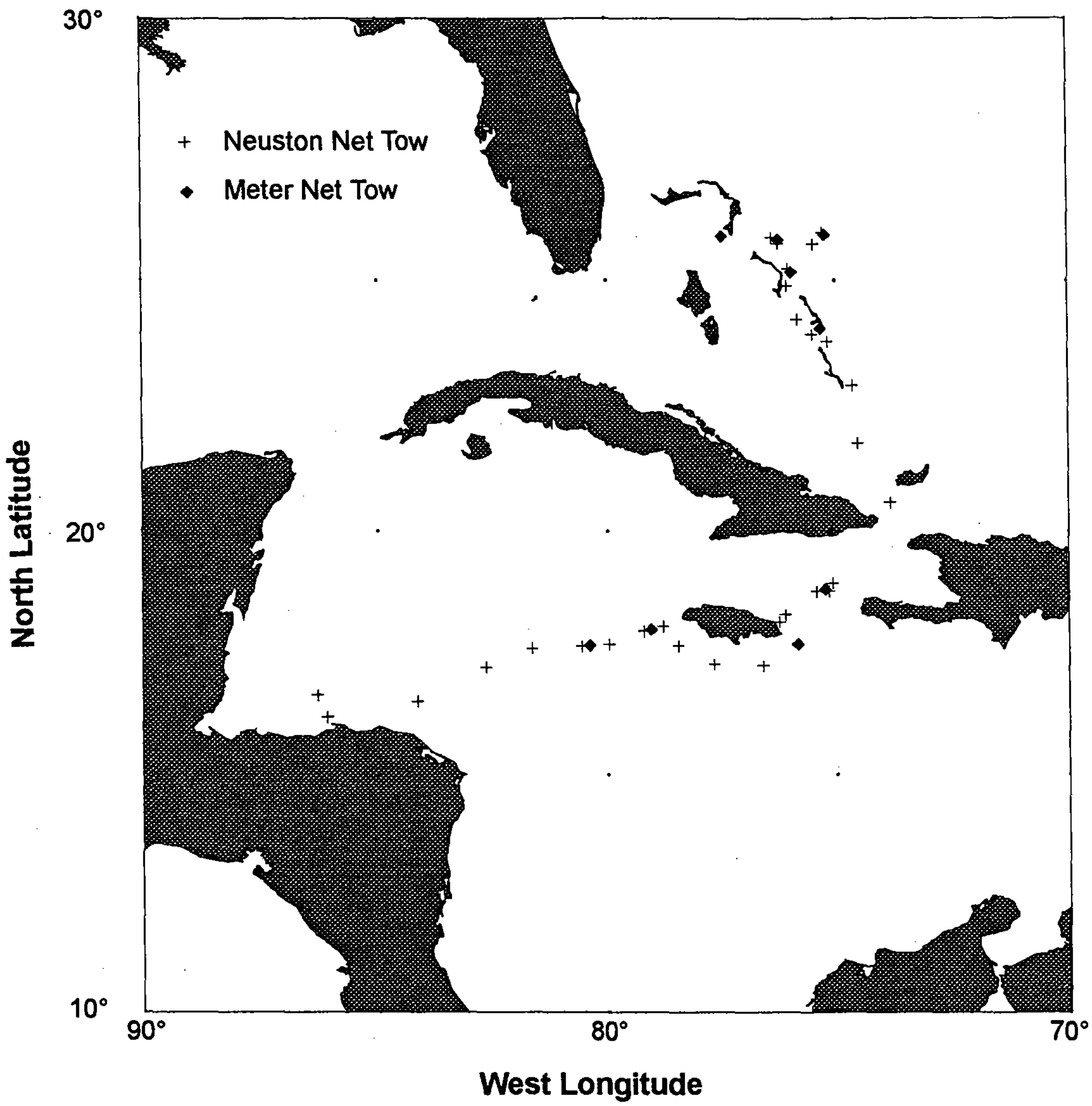


Figure 4: Geological Station Locations, C-137

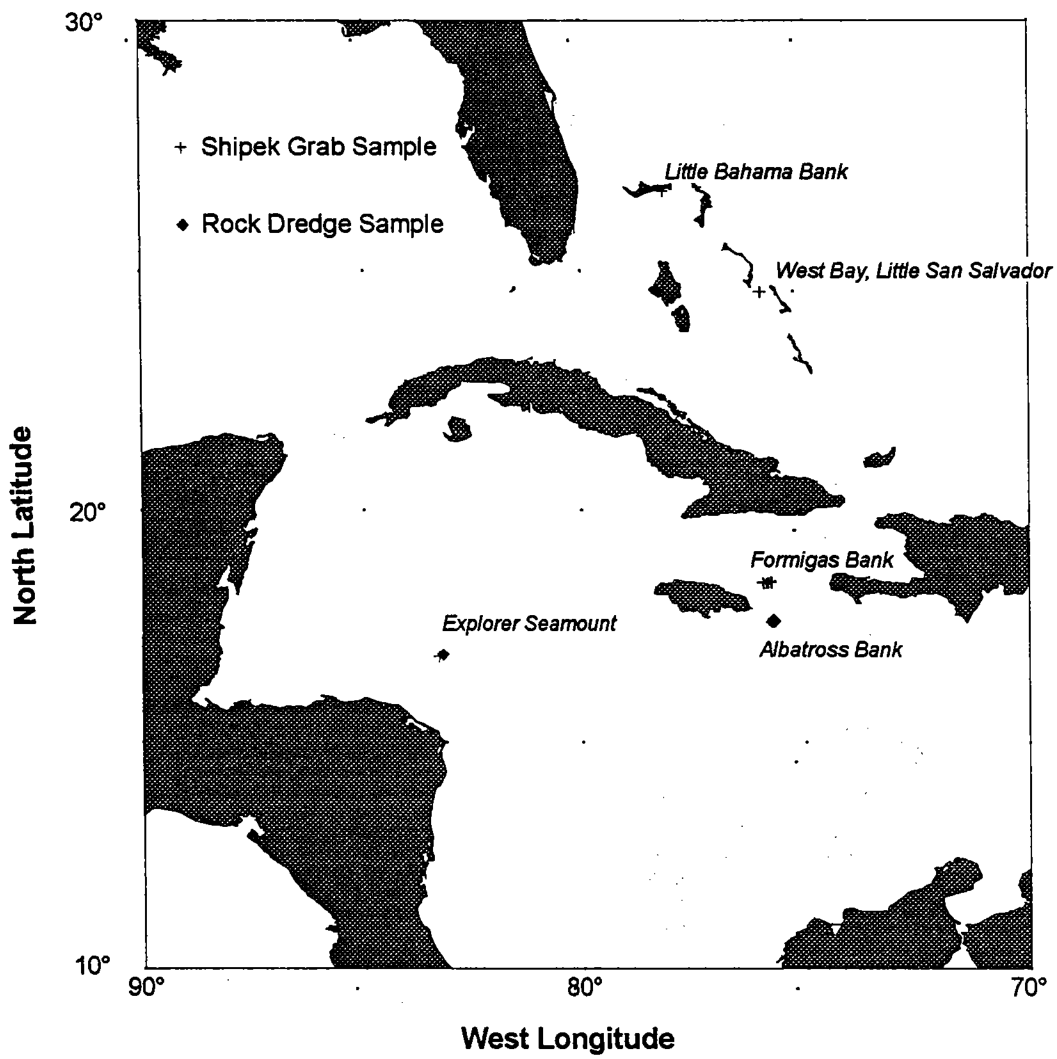
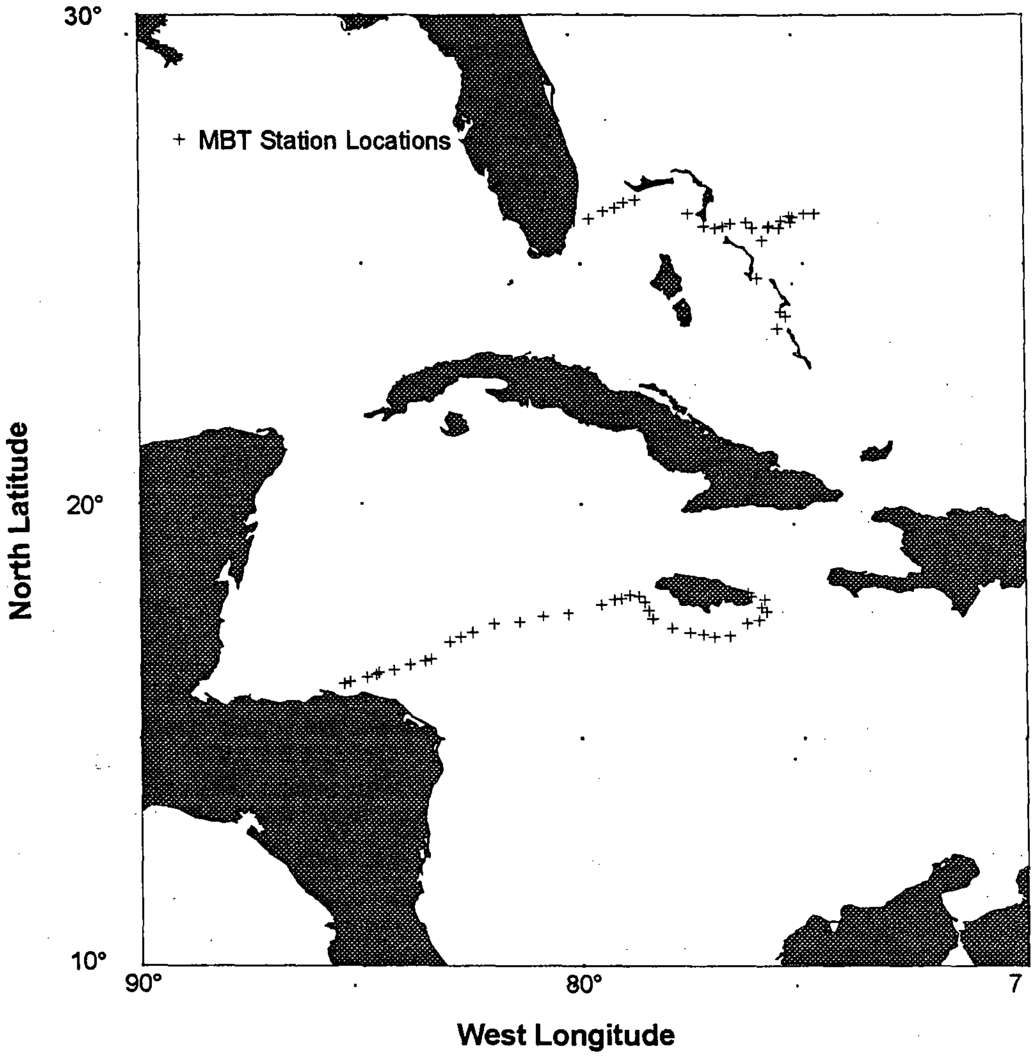


Figure 5: Mechanical Bathythermograph (MBT) Stations



Appendix A: C-137 Oceanographic Stations

Station	Date	Local Time	Log	Latitude	Longitude	Cast Depth	Locale
		hrs.	nm.	° North	° West	m.	
CTD Stations							
C-137 -005	Feb. 09, 95	1200	231.7	25°52	76°26	1,500	Southern Sargasso
C-137 -008	Feb. 09, 95	1640	240.9	25°52	76°20	650	Southern Sargasso
C-137 -011	Feb. 10, 95	0920	291.0	25°44	75°31	1,500	Southern Sargasso
C-137 -016	Feb. 10, 95	2024	320.4	25°54	75°10	1,200	Southern Sargasso
C-137 -019	Feb. 11, 95	0917	378.1	26°03	74°28	1,500	Southern Sargasso
C-137 -023	Feb. 11, 95	1133	378.1	26°04	74°31	1,600	Southern Sargasso
C-137 -028	Feb. 12, 95	1455	494.5	25°14	76°00	1,000	Southern Sargasso
C-137 -043	Feb. 17, 95	1045	802.7	22°57	74°37	1,600	Crooked Island Psg.
C-137 -046	Feb. 19, 95	0015	1020.0	20°36	73°52	1,600	N. of Windward Psg.
C-137 -049	Feb. 20, 95	0400	1150.6	19°01	75°03	1,600	S. of Windward Psg.
C-137 -055	Feb. 20, 95	1751	1165.1	19°01	75°04	1,600	NE of Jamaica
C-137 -060	Feb. 21, 95	0605	1201.5	18°29	75°32	550	E. of Formigas Bank
C-137 -087	Feb. 26, 95	1421	1391.7	17°37	75°50	1,500	W. of Albatross Bank
C-137 -092	Feb. 28, 95	1015	1603.6	18°05	78°45	1,250	E. of Cayman Trough
C-137 -099	Mar. 01, 95	1035	1675.2	17°43	79°56	1,600	Cayman Trough
C-137 -107	Mar. 02, 95	0830	1775.6	17°28	81°37	1,200	Cayman Trough
C-137 -113	Mar. 03, 95	0518	1863.5	17°08	82°59	1,000	NE of Emperor Seamt
C-137 -123	Mar. 04, 95	1432	2049.2	16°11	85°29	450	18 NM east of Roatan
Carousel/Hydrocast Stations							
C-137 -006	Feb. 09, 95	1200	231.7	25°52	76°26	1,500	Southern Sargasso
C-137 -012	Feb. 10, 95	1010	291.0	25°44	75°31	1,500	Southern Sargasso
C-137 -020	Feb. 11, 95	0917	378.1	26°03	74°28	1,500	Southern Sargasso
C-137 -029	Feb. 12, 95	1455	494.5	25°14	75°59	1,000	Southern Sargasso
C-137 -047	Feb. 19, 95	0052	1020.0	20°36	73°52	975	N. of Windward Psg.
C-137 -050	Feb. 20, 95	0400	1150.6	19°01	75°04	1,500	NE of Jamaica
C-137 -061	Feb. 21, 95	0605	1201.5	18°29	75°32	500	E of Formigas Bank
C-137 -093	Feb. 28, 95	1015	1603.6	18°05	78°45	1,250	E. of Cayman Trough
C-137 -100	Mar. 01, 95	1015	1675.2	17°43	79°56	1,500	Cayman Trough
C-137 -114	Mar. 03, 95	0518	1863.5	17°08	82°59	1,000	NE Emperor Seamt.
C-137 -124	Mar. 04, 95	1432	2049.2	16°11	85°29	401	East of Roatan

Station	Date	Local Time	Log	Latitude	Longitude	Cast Depth	Locale
		hrs.	nm.	° North	° West	m.	
Neuston Net Tows							
C-137 -007	Feb. 09, 95	1507	236.5	25°51	76°22	0	Southern Sargasso
C-137 -010	Feb. 10, 95	0013	247.5	25°44	76°13	0	NE of Eleuthera
C-137 -015	Feb. 10, 95	1235	294.0	25°43	75°28	0	Southern Sargasso
C-137 -018	Feb. 11, 95	0020	328.3	25°56	75°16	0	Sargasso Sea
C-137 -025	Feb. 12, 95	0014	429.9	25°57	75°16	0	Southern Sargasso
C-137 -026	Feb. 12, 95	1243	490.5	25°14	76°01	0	NE of Eleuthera
C-137 -031	Feb. 13, 95	0003	521.7	24°54	76°02	0	NE of Eleuthera
C-137 -039	Feb. 16, 95	0002	610.4	24°13	75°49	0	W of Cat Island
C-137 -040	Feb. 16, 95	1234	673.0	23°56	75°30	0	S of Cat Island
C-137 -042	Feb. 17, 95	0000	730.5	23°48	75°10	0	SW of Conception
C-137 -044	Feb. 17, 95	1210	803.2	22°56	74°39	0	Crooked Island Psg
C-137 -045	Feb. 18, 95	0003	884.3	21°47	74°32	0	S of Great Inagua
C-137 -048	Feb. 19, 95	0145	1020.0	20°35	73°50	0	N of Windward Psg
C-137 -052	Feb. 20, 95	0643	1151.0	18°58	75°05	0	S of Windward Psg
C-137 -054	Feb. 20, 95	1247	1162.6	18°48	75°10	0	North Caribbean
C-137 -059	Feb. 21, 95	0000	1183.6	18°48	75°26	0	North Caribbean
C-137 -076	Feb. 22, 95	1233	1162.6	18°19	76°06	0	North Caribbean
C-137 -079	Feb. 26, 95	0200	1341.0	17°44	75°51	0	W of Albatross Bank
C-137 -089	Feb. 27, 95	0123	1451.0	17°16	76°35	0	S coast Jamaica
C-137 -090	Feb. 27, 95	1210	1517.8	17°18	77°38	0	South of Jamaica
C-137 -091	Feb. 28, 95	0009	1575.9	17°41	78°27	0	South of Jamaica
C-137 -096	Feb. 28, 95	1223	1604.1	18°05	78°47	0	SW of Jamaica
C-137 -098	Mar. 01, 95	0000	1626.8	17°59	79°12	0	SW of Jamaica
C-137 -104	Mar. 01, 95	1245	1675.2	17°43	79°58	0	SW of Jamaica
C-137 -106	Mar. 01, 95	2335	1713.2	17°40	80°35	0	W Cayman Trough
C-137 -111	Mar. 02, 95	1222	1783.1	17°38	81°40	0	Cayman Trough
C-137 -112	Mar. 03, 95	0013	1841.1	17°14	82°40	0	NE of Explorer Seamt
C-137 -121	Mar. 04, 95	0030	1952.2	16°31	84°10	0	NE of Roatan
C-137 -126	Mar. 05, 95	0011	2070.5	16°11	86°06	0	E of Roatan
C-137 -077	Feb. 25, 95	1225	1283.0	18°10	76°13	0	N of Jamaica
C-137 -127	Mar. 08, 95	1202	2140.0	16°39	86°18	0	N of Honduras
Meter Net Tows							
C-137 -004A	Feb. 08, 95	2055	175.0	25°52	77°27	200	Southern Sargasso

Station	Date	Local Time	Log	Latitude	Longitude	Cast Depth	Locale
		hrs.	nm.	° North	° West	m.	
C-137 -004B	Feb. 08, 95	2055	175.0	25°52	77°27	100	Southern Sargasso
C-137 -009A	Feb. 09, 95	2120	246.3	25°48	76°13	200	Southern Sargasso
C-137 -009B	Feb. 09, 95	2120	246.3	25°48	76°13	100	Southern Sargasso
C-137 -017A	Feb. 10, 95	2149	321.5	25°54	75°13	200	Southern Sargasso
C-137 -017B	Feb. 10, 95	2149	321.5	25°54	75°13	100	Southern Sargasso
C-137 -030	Feb. 12, 95	2035	506.3	25°10	75°57	200	E of Eleuthera
C-137 -041	Feb. 16, 95	2012	707.1	24°03	75°20	100	N of Conception Isl.
C-137 -058	Feb. 20, 95	2026	1165.4	18°50	75°15	100	SW of Haiti
C-137 -078	Feb. 25, 95	2213	1324.8	17°42	75°50	100	E of Jamaica
C-137 -097	Feb. 28, 95	0840	1617.5	18°01	79°03	100	SW of Jamaica
C-137 -105	Mar. 01, 95	2010	1702.4	17°41	80°24	100	W Cayman Trough
Shipek Grab Stations							
C-137 -001	Feb. 08, 95	1025	118.8	26°37	78°07	150	Little Bahama Bank
C-137 -002	Feb. 08, 95	1035	118.9	26°37	78°07	120	Little Bahama Bank
C-137 -003	Feb. 08, 95	1042	119.0	26°37	78°07	48	Little Bahama Bank
C-137 -033	Feb. 15, 95	1755	587.4	24°35	75°58	18	Little San Salvador
C-137 -034	Feb. 15, 95	1805	587.4	24°35	75°58	26	Little San Salvador
C-137 -035	Feb. 15, 95	1815	587.4	24°35	75°58	225	Little San Salvador
C-137 -036	Feb. 15, 95	1841	587.4	24°35	75°58	439	Little San Salvador
C-137 -038	Feb. 15, 95	1908	587.7	24°35	75°59	603	Little San Salvador
C-137 -037	Feb. 15, 95	1855	587.7	24°35	75°58	511	Little San Salvador
C-137 -063	Feb. 21, 95	0911	1215.5	18°28	75°45	472	Formigas Bank
C-137 -064	Feb. 21, 95	0942	1215.8	18°28	75°45	45	Formigas Bank
C-137 -065	Feb. 21, 95	0951	1216.0	18°28	75°45	24	Formigas Bank
C-137 -066	Feb. 21, 95	1000	1216.0	18°28	75°46	23	Formigas Bank
C-137 -067	Feb. 21, 95	1010	1216.0	18°28	75°46	14	Formigas Bank
C-137 -068	Feb. 21, 95	1200	1216.0	18°28	75°46	10	Formigas Bank
C-137 -069	Feb. 21, 95	1311	1216.0	18°30	75°47	11	Formigas Bank
C-137 -070	Feb. 21, 95	1530	1216.0	18°28	75°49	13	Formigas Bank
C-137 -071	Feb. 21, 95	1605	1216.0	18°28	75°51	71	Formigas Bank
C-137 -072	Feb. 21, 95	1618	1216.0	18°28	75°51	207	Formigas Bank
C-137 -073	Feb. 21, 95	1641	1216.0	18°28	75°57	286	Formigas Bank
C-137 -074	Feb. 21, 95	1715	1216.0	18°27	75°53	605	Formigas Bank
C-137 -075	Feb. 21, 95	1809	1216.0	18°27	75°55	953	Formigas Bank
C-137 -080	Feb. 26, 95	0848	1375.5	17°41	75°43	35	Albatross Bank

Station	Date	Local Time hrs.	Log nm.	Latitude ° North	Longitude ° West	Cast Depth m.	Locale
C-137 -081	Feb. 26, 95	0858	1375.6	17°41	75°43	37	Albatross Bank
C-137 -120	Mar. 03, 95	1412	1894.4	16°54	83°19	33	Explorer Seamount
C-137 -115	Mar. 03, 95	1045	1888.7	16°57	83°14	74	Explorer Seamount
C-137 -116	Mar. 03, 95	1055	1888.7	16°57	83°14	39	Explorer Seamount
C-137 -117	Mar. 03, 95	1102	1888.7	16°57	83°14	35	Explorer Seamount
C-137 -118	Mar. 03, 95	1124	1889.0	16°56	83°14	36	Explorer Seamount
Rock Dredge Stations							
C-137 -082	Feb. 26, 95	0900	1375.6	17°41	75°43	18	Albatross Bank
C-137 -083	Feb. 26, 95	1103	1379.5	17°39	75°41	30	Albatross Bank
C-137 -084	Feb. 26, 95	1155	1381.9	17°39	75°43	26	Albatross Bank
C-137 -085	Feb. 26, 95	1210	1382.0	17°39	75°43	34	Albatross Bank
C-137 -086	Feb. 26, 95	1300	1385.1	17°38	75°45	29	Albatross Bank
C-137 -119	Mar. 03, 95	1133	1889.0	16°56	83°14	34	Explorer Seamount

Appendix B: Surface Sample Data

Station	Date	Local Time	Log	Latitude	Longitude	MBT*	Temp	Sal	PO_4	Chl *a*
		hrs	nm.	° North	° West	No.	(° C)	(‰)	(µM)	(µg/l)
SS-001	Feb. 08, 95	2337	184.5	25°48	77°17	7	23.3	36.66	0.19	0.23
SS-002	Feb. 09, 95	0300	200.9	25°44	77°01	8	23.2	36.64	0.03	0.25
SS-003	Feb. 09, 95	0600	210.8	25°46	76°48	9	22.5	36.75		0.20
SS-004	Feb. 09, 95	0827	220.0	25°49	76°37	10	22.7	36.70	0.16	0.25
SS-005	Feb. 09, 95	1935	242.2	25°51	76°16	11	22.4	36.65	0.15	0.28
SS-006	Feb. 10, 95	0323	262.9	25°44	76°02		22.9	36.75	0.19	0.36
SS-007	Feb. 10, 95	0600	277.0	25°45	75°47	13	22.8	36.76	0.34	0.29
SS-008	Feb. 10, 95	0742	290.0	25°44	75°32	14	21.6	36.71	0.16	0.21
SS-009	Feb. 10, 95	1245	294.3	25°44	75°29		23.0			
SS-010	Feb. 10, 95	1700	312.3	25°51	76°16		21.6	36.76	0.14	0.16
SS-011	Feb. 11, 95	0200	335.0	25°57	75°13	16	22.0	36.72	0.23	0.16
SS-012	Feb. 11, 95	0620	363.0	26°01	74°44	17	22.4			0.16
SS-013	Feb. 11, 95	1142	370.1	26°04	74°31		22.6	36.67		0.56
SS-014	Feb. 11, 95	1500	387.3	26°01	74°43	18	22.1	36.68	0.13	0.05
SS-015	Feb. 11, 95	1800	401.1	26°01	74°57	19	22.9	36.72	0.17	0.06
SS-016	Feb. 11, 95	2030	414.5	25°59	75°15		22.9	36.81	0.73	0.17
SS-017	Feb. 12, 95	0030	430.3	25°57	75°17		22.9	36.64	0.31	0.20
SS-018	Feb. 12, 95	0525	451.3	24°47	75°45	22	22.7	36.75	0.06	0.14
SS-019	Feb. 13, 95	0223	524.3	24°42	76°03	24	24.7	36.84		
SS-020	Feb. 13, 95	0520	552.7	24°33	76°13		24.7	36.84	0.08	0.15
SS-021	Feb. 14, 95	1300	580.0	24°35	76°58		27.3			
SS-022	Feb. 16, 95	0008	610.4	24°13	75°49		24.7	36.63	0.19	0.07
SS-023	Feb. 16, 95	0800	651.3	23°41	75°35	25	24.8			0.05
SS-024	Feb. 16, 95	1100	663.4	24°01	75°30	26	24.9			0.10
SS-025	Feb. 16, 95	1735	694.9	23°56	75°24	27	24.9		0.50	0.01
SS-026	Feb. 17, 95	0000	730.5	23°48	75°10		25.6			0.01
SS-027	Feb. 17, 95	0600	770.8	23°17	74°53		25.4		0.59	0.06
SS-028	Feb. 17, 95	0900	793.0	23°08	74°42		25.2		0.04	0.07
SS-029	Feb. 17, 95	1215	803.3	22°56	74°39		25.9		0.21	0.04
SS-030	Feb. 17, 95	1800	838.5	22°27	74°36		25.9		<0.01	0.05
SS-031	Feb. 18, 95	0004	884.5	21°47	74°32		25.7		0.01	0.04
SS-032	Feb. 18, 95	1120	954.1	20°53	74°11		26.2		0.05	0.02
SS-033	Feb. 18, 95	1610	984.6	21°00	73°48		26.5		0.07	0.06
SS-034	Feb. 19, 95	0537	1045.6	20°15	70°55		26.0		0.37	0.08

Station	Date	Local Time	Log	Latitude	Longitude	MBT*	Temp	Sal	PO_4	Chl *a*
		hrs	nm.	° North	° West	No.	(° C)	(‰)	(μM)	(μg/l)
SS-035	Feb. 20, 95	0015	1183.3	18°48	75°26		26.6		<0.01	0.02
SS-036	Feb. 21, 95	0500	1196.1	18°29	75°29		26.8		0.14	0.02
SS-037	Feb. 21, 95	0800	1209.0	18°28	75°37		27.1		0.05	0.10
SS-038	Feb. 21, 95	0900	1215.0	18°28	75°37		27.1		0.20	0.08
SS-039	Feb. 21, 95	1025		18°29	75°46		27.2		0.06	0.09
SS-040	Feb. 21, 95	1100		18°28	75°46		27.2		0.02	0.13
SS-041	Feb. 21, 95	1200		18°29	75°47		27.7		<0.01	0.10
SS-042	Feb. 21, 95	1300		18°29	75°46		27.0			0.04
SS-043	Feb. 21, 95	1400		18°29	75°46		26.5		0.06	0.07
SS-044	Feb. 21, 95	1500		18°29	75°48		27.1			
SS-045	Feb. 21, 95	1550		18°28	75°50		27.2		<0.01	0.01
SS-046	Feb. 21, 95	1700		18°28	75°53		27.8		<0.01	0.01
SS-047	Feb. 21, 95	1800		18°27	75°55		27.6		0.02	0.05
SS-048	Feb. 25, 95	1516	1287.2	18°07	76°16	28	26.9		0.00	0.12
SS-049	Feb. 25, 95	1706	1293.6	18°02	76°12	29	26.9			0.08
SS-050	Feb. 25, 95	2015	1314.2	17°49	75°57	30	26.5		0.04	0.08
SS-051	Feb. 26, 95	0216	1341.2	17°43	75°51	31	26.6		0.04	0.15
SS-052	Feb. 26, 95	0600	1360.0	17°59	75°54	32	26.7		0.11	0.13
SS-053	Feb. 26, 95	0700	1360.0	17°59	75°54		26.7			0.22
SS-054	Feb. 26, 95	0800	1372.2	17°44	75°46		26.4		0.02	0.19
SS-055	Feb. 26, 95	0906	1376.0	17°10	75°43		26.1		0.01	
SS-056	Feb. 26, 95	1005	1376.5	17°40	75°43		26.5		0.04	0.20
SS-057	Feb. 26, 95	1100	1379.5	17°39	75°41		26.7			0.21
SS-058	Feb. 26, 95	1200	1381.9	17°39	75°43		26.6		0.61	0.17
SS-059	Feb. 26, 95	1250	1385.0	17°38	75°45		26.4		0.04	0.18
SS-060	Feb. 26, 95	1430	1391.7	17°37	75°50		26.8		0.02	0.07
SS-061	Feb. 26, 95	1812	1404.1	17°32	76°01	33	26.3		<0.01	0.09
SS-062	Feb. 27, 95	0235	1456.0	17°13	76°37		26.4		0.05	0.15
SS-063	Feb. 27, 95	0600	1483.3	17°11	77°02	36	26.7		0.00	0.14
SS-064	Feb. 27, 95	0800	1497.5	17°14	77°16	37	26.7		<0.01	0.06
SS-065	Feb. 27, 95	1107	1513.5	17°17	77°34	38	26.9			0.16
SS-066	Feb. 27, 95	1637	1539.5	17°22	78°00	39	26.9			
SS-067	Feb. 27, 95	2230	1567.8	17°34	78°24	40	27.1			0.05
SS-068	Feb. 28, 95	0200	1583.0	17°45	78°30	41	27.2		0.44	0.03
SS-069	Feb. 28, 95	0540	1593.3	17°56	78°36	42	27.2		<0.01	0.23
SS-070	Feb. 28, 95	0910	1601.3	18°03	78°43	43	27.1		0.01	0.08

Station	Date	Local Time	Log	Latitude	Longitude	MBT*	Temp	Sal	PO_4	Chl *a*
		hrs	nm.	° North	° West	No.	(° C)	(‰)	(µM)	(µg/l)
SS-071	Feb. 28, 95	1740	1610.8	18°04	78°56	44	27.5		0.03	0.08
SS-072	Feb. 28, 95	2217	1622.2	18°00	79°03	45	26.9		0.02	0.08
SS-073	Mar. 01, 95	0100	1630.4	17°58	79°16	46	26.7		0.03	0.09
SS-074	Mar. 01, 95	0405	1650.0	17°52	79°33	47	26.8		<0.01	0.27
SS-075	Mar. 01, 95	1835	1697.2	17°41	80°18	48	27.0		0.04	0.09
SS-076	Mar. 02, 95	0210	1730.0	17°37	80°52	49	26.8		0.01	0.08
SS-077	Mar. 02, 95	0625	1762.5	17°30	81°24	50	27.0		0.03	
SS-078	Mar. 02, 95	1028	1775.7	17°30	81°39		27.1		0.02	0.09
SS-079	Mar. 02, 95	1640	1800.5	17°28	81°59	51	27.2		<0.01	
SS-080	Mar. 02, 95	2155	1828.6	17°17	82°28	52	26.9		<0.01	0.10
SS-081	Mar. 03, 95	0208	1848.4	17°10	82°45	53	26.8		0.00	0.10
SS-082	Mar. 03, 95	0718	1866.5	17°05	82°60	54	27.2		0.17	0.11
SS-083	Mar. 03, 95	1124	1889.0	16°56	83°14		27.1		0.00	0.11
SS-084	Mar. 03, 95	1335	1892.7	16°53	83°17		27.0		0.09	0.19
SS-085	Mar. 03, 95	1803	1907.8	16°42	83°25	55	27.1		0.00	0.10
SS-086	Mar. 03, 95	1854	1915.8	16°40	83°35	56	27.3		0.00	0.06
SS-087	Mar. 03, 95	2200	1936.2	16°35	83°55	57	27.0		0.15	0.09
SS-088	Mar. 04, 95	0230	1960.7	16°28	84°17	58	26.6		0.54	0.18
SS-089	Mar. 04, 95	0445	1974.4	16°25	84°33	59	26.5		0.12	0.10
SS-090	Mar. 04, 95	0608	1885.4	16°23	84°41	60	26.5			0.12
SS-091	Mar. 04, 95	0805	1999.9	16°19	85°54	61	27.1		0.00	0.11
SS-092	Mar. 04, 95	1204	2027.1	16°13	85°18	62	27.1		0.00	
SS-093	Mar. 04, 95	1315	2034.2	16°11	85°25	63	27.6		0.04	0.11
SS-094	Mar. 04, 95	2313	2066.0	16°12	86°01		26.8		0.09	0.09

* MBT number: station number of MBT cast completed with surface station

Appendix C: Neuston Tow Data

Station	T_s	Tow Dist.	Zoopl. Biomass	*Halobates*	Tar	Plastic Pieces	Plastic Pellets	*Sargassum fluitans*	*Sargassum natans*
	(°C)	(m.)	(ml.)	(number)	(grams)	(number)	(number)	(grams)	(grams)
C-137 -007	23.1	1852	2	0	0.06	0	1	0	0
C-137 -010	22.4	1111	11	0	0.16	0	0	0	0
C-137 -015	22.3	1852	10	0	0.09	5	0	0	0
C-137 -018	22.3	1945	10	0	0.43	0	0	1	2
C-137 -025	23.0	1852	15	1		15	0	280	0
C-137 -026	23.8	1852	4	0	0.06	2	0	0	0
C-137 -031	23.8	1852	17	0	0.06	0	0	0	0
C-137 -039	24.7	2037	4	0	0.06	0	0	0	0
C-137 -040	25.1	1852	2	0	0.00	4	0	0	0
C-137 -042	25.6	1852	5	0	0.00	0	0	0	0
C-137 -044	25.9	926	1	0	0.03	0	0	0	0
C-137 -045	25.7	1852	3	0	0.06	0	0	0	0
C-137 -048	26.5	1852	4	0					
C-137 -052	26.6	1852	8	1	0.20	8	0	0	0
C-137 -054	27.0	1852	15	6	0.00	4	1	0	0
C-137 -059	26.6	1852	40	1	0.06	3	0	0	0
C-137 -076	26.0	1852	13	3	0.91	1			
C-137 -077	27.2	1852	13	0	0.24	8	0	0	
C-137 -079	26.8	1852	16	0	0.00	0			
C-137 -089	26.4	1852	26	7	0.06	1	0	0	0
C-137 -090	27.1	2222	2	4	0.04	4	0	0	0
C-137 -091	27.1	1852	10	3	0.04	0	0		
C-137 -096	27.6	1667	35	5	0.05	14	1	0	0
C-137 -098	26.9	2222	25	8	0.00	0	0	0	0
C-137 -104	27.1	1852	3	26	0.04	4	1		
C-137 -106	27.0	2037	19	19	0.00				
C-137 -111	26.5	1852	3	14	0.09				
C-137 -112	27.0	1852	33	16	0.00				
C-137 -121	26.9	1667	75	1	0.00				
C-137 -126	26.7	1852	20	1	0.00	2	2		
C-137 -127	27.3	1667	10	0		0	0	0	0

Appendix D: Bathythermograph Station Data

Station	Date	Local Time	Log	Latitude	Longitude	Surface Temp
		hrs.	nm.	° North	° West	(° C)
BT-001	Feb. 07, 95	1541	12.4	25°56	79°48	24.4
BT-002	Feb. 07, 95	1817	30.6	26°05	79°28	24.1
BT-003	Feb. 07, 95	2002	43.2	26°09	79°13	23.8
BT-004	Feb. 07, 95	2152	55.8	26°15	79°02	23.5
BT-005	Feb. 08, 95	0000	72.5	26°19	78°46	23.8
BT-006	Feb. 08, 95	1830	164.4	26°01	77°34	23.0
BT-007	Feb. 09, 95	0000	187.7	25°46	77°14	23.4
BT-008	Feb. 09, 95	0342	201.0	25°44	76°58	22.6
BT-009	Feb. 09, 95	0625	210.8	25°46	76°48	22.5
BT-010	Feb. 09, 95	0832	220.0	25°49	76°37	22.7
BT-011	Feb. 09, 95	1935	242.2	25°51	76°16	22.4
BT-012	Feb. 10, 95	0237	256.9	25°44	76°08	22.8
BT-013	Feb. 10, 95	0530	277.0	25°45	75°47	22.8
BT-014	Feb. 10, 95	0742	290.0	25°44	75°32	21.6
BT-015	Feb. 10, 95	1700	312.3	25°51	75°16	21.6
BT-016	Feb. 11, 95	0200	335.0	25°57	75°13	22.0
BT-017	Feb. 11, 95	0620	363.0	26°01	74°44	22.4
BT-018	Feb. 11, 95	1500	387.3	26°01	74°43	22.1
BT-022	Feb. 12, 95	0525	451.9	25°47	75°45	22.7
BT-019	Feb. 11, 95	1800	401.1	26°01	74°57	22.9
BT-020	Feb. 11, 95	2050	416.7	25°59	75°18	22.7
BT-021	Feb. 12, 95	0233	439.9	25°53	75°29	22.6
BT-023	Feb. 12, 95	0809	472.5	25°29	75°55	23.4
BT-024	Feb. 13, 95	0223	524.3	24°42	76°03	24.7
BT-025	Feb. 16, 95	0800	651.3	23°41	75°35	24.8
BT-026	Feb. 16, 95	1100	663.4	24°01	75°30	24.9
BT-027	Feb. 16, 95	1732	694.9	23°56	75°24	24.9
BT-028	Feb. 25, 95	1516	1287.2	18°07	76°16	26.9
BT-029	Feb. 25, 95	1706	1293.6	18°02	76°12	26.9
BT-030	Feb. 25, 95	2015	1314.2	17°49	75°57	26.5
BT-031	Feb. 26, 95	0216	1341.2	17°43	75°51	26.6
BT-032	Feb. 26, 95	0600	1360.0	17°59	75°54	26.7
BT-033	Feb. 26, 95	1812	1404.1	17°32	76°01	26.3

Station	Date	Local Time	Log	Latitude	Longitude	Surface Temp
		hrs.	nm.	° North	° West	(° C)
BT-034	Feb. 26, 95	2111	1423.9	17°28	76°18	26.6
BT-035	Feb. 27, 95	0310	1461.0	17°12	76°41	26.7
BT-036	Feb. 27, 95	0600	1483.3	17°11	77°02	26.7
BT-037	Feb. 27, 95	0807	1497.5	17°14	77°16	26.7
BT-038	Feb. 27, 95	1116	1514.5	17°17	77°34	26.9
BT-039	Feb. 27, 95	1637	1539.5	17°22	77°58	26.9
BT-040	Feb. 27, 95	2230	1567.8	17°34	78°24	27.1
BT-041	Feb. 28, 95	0200	1593.0	17°45	78°30	27.2
BT-042	Feb. 28, 95	0539	1593.3	17°56	78°36	27.2
BT-043	Feb. 28, 95	0910	1601.3	18°03	78°43	27.1
BT-044	Feb. 28, 95	1740	1610.8	18°04	78°56	27.5
BT-045	Feb. 28, 95	2217	1622.2	18°00	79°07	26.9
BT-046	Mar. 01, 95	0100	1630.4	17°58	79°16	26.7
BT-047	Mar. 01, 95	0405	1650.0	17°52	79°33	26.8
BT-048	Mar. 01, 95	1835	1697.2	17°41	80°18	27.0
BT-049	Mar. 02, 95	0210	1730.0	17°37	80°52	26.0
BT-050	Mar. 02, 95	0625	1762.5	17°30	81°24	27.0
BT-051	Mar. 02, 95	1640	1800.5	17°28	81°59	27.2
BT-052	Mar. 02, 95	2155	1828.6	17°17	82°28	26.9
BT-053	Mar. 03, 95	0208	1848.4	17°11	82°45	26.8
BT-054	Mar. 03, 95	0718	1866.5	17°05	82°60	27.2
BT-055	Mar. 03, 95	1710	1907.8	16°42	83°25	27.1
BT-056	Mar. 03, 95	1856	1915.8	16°40	83°35	27.7
BT-057	Mar. 03, 95	2200	1936.2	16°35	83°55	27.0
BT-058	Mar. 04, 95	0230	1960.7	16°28	84°17	26.6
BT-059	Mar. 04, 95	0445	1974.4	16°25	84°38	26.5
BT-060	Mar. 04, 95	0608	1985.4	16°23	84°41	26.5
BT-061	Mar. 04, 95	0805	1999.9	16°19	84°54	27.1
BT-062	Mar. 04, 95	1204	2027.1	16°13	85°18	27.1
BT-063	Mar. 04, 95	1314	2034.2	16°11	85°25	27.6

Appendix E: Hydrocast Station Data

Station	CTD no.	Bottle no.	Bottle Depth (m)	PO_4 (μM)	Chl *a* (μg/l)	O_2 (ml/l)
C-137 -006	C-137 -006	1	1,500			
C-137 -006	C-137 -006	2	1,000			
C-137 -006	C-137 -006	3	750			
C-137 -006	C-137 -006	4	500			
C-137 -006	C-137 -006	5	350			
C-137 -006	C-137 -006	6	200			
C-137 -006	C-137 -006	7	150			
C-137 -006	C-137 -006	8	100			
C-137 -006	C-137 -006	9	75			
C-137 -006	C-137 -006	10	50			
C-137 -006	C-137 -006	11	25			
C-137 -012	C-137 -011	1	1,500	1.13		6.47
C-137 -012	C-137 -011	2	1,000	1.22		4.63
C-137 -012	C-137 -011	3	750	1.05		4.45
C-137 -012	C-137 -011	4	500	0.28	0.00	4.90
C-137 -012	C-137 -011	5	300	0.29	0.00	5.28
C-137 -012	C-137 -011	6	150	0.02	0.03	5.28
C-137 -012	C-137 -011	7	100	0.07	0.37	5.76
C-137 -012	C-137 -011	8	75	0.00	0.27	5.95
C-137 -012	C-137 -011	9	50	0.00	0.34	5.98
C-137 -012	C-137 -011	10	25	0.15		6.09
C-137 -012	C-137 -011	11	10	0.00	0.01	5.76
C-137 -020	C-137 -019	1	1,500	1.42	0.01	6.62
C-137 -020	C-137 -019	2	1,000			
C-137 -020	C-137 -019	3	750	1.13		4.17
C-137 -020	C-137 -019	4	500	0.31	0.00	4.90
C-137 -020	C-137 -019	5	300	0.15	0.00	5.37
C-137 -020	C-137 -019	6	150	0.00	0.11	5.41
C-137 -020	C-137 -019	7	100	1.06	0.20	5.83
C-137 -020	C-137 -019	8	75	0.00	0.16	6.02
C-137 -020	C-137 -019	9	50	0.00	0.16	5.95
C-137 -020	C-137 -019	10	25	0.18	0.14	5.94
C-137 -020	C-137 -019	11	10	0.00	0.07	5.91
C-137 -029	C-137 -028	1	1,000	1.18		5.58

Station	CTD no.	Bottle no.	Bottle Depth (m)	PO_4 (µM)	Chl *a* (µg/l)	O_2 (ml/l)
C-137 -029	C-137 -028	2	750			
C-137 -029	C-137 -028	3	500	0.38	0.00	4.84
C-137 -029	C-137 -028	4	400		0.00	5.14
C-137 -029	C-137 -028	5	300	0.17	0.01	5.39
C-137 -029	C-137 -028	6	200	0.12	0.03	5.37
C-137 -029	C-137 -028	7	150	0.00	0.12	5.83
C-137 -029	C-137 -028	8	75	1.06	0.02	5.81
C-137 -029	C-137 -028	9	50	0.14	0.24	5.78
C-137 -029	C-137 -028	10	25	0.08	0.20	5.71
C-137 -029	C-137 -028	11	10	0.03	0.18	5.60
C-137 -047	C-137 -046	1	975			4.15
C-137 -050	C-137 -049	1	1,500			
C-137 -050	C-137 -049	2	1,000			
C-137 -050	C-137 -049	3	700			
C-137 -050	C-137 -049	4	500			
C-137 -050	C-137 -049	5	300	0.24	0.00	4.74
C-137 -050	C-137 -049	6	200	0.06	0.01	5.03
C-137 -050	C-137 -049	7	100	0.07	0.08	5.68
C-137 -050	C-137 -049	8	75	0.20	0.34	5.07
C-137 -050	C-137 -049	9	50		0.11	5.32
C-137 -050	C-137 -049	10	25	0.10		4.80
C-137 -050	C-137 -049	11	10			
C-137 -061	C-137 -060	1	500			
C-137 -061	C-137 -060	2	400	0.73	0.00	4.78
C-137 -061	C-137 -060	3	300	0.23	0.00	5.34
C-137 -061	C-137 -060	4	250	0.07	0.01	4.95
C-137 -061	C-137 -060	5	200	0.04	0.01	5.14
C-137 -061	C-137 -060	6	175	0.00	0.06	5.25
C-137 -061	C-137 -060	7	150	0.04	0.07	5.24
C-137 -061	C-137 -060	8	75	0.14	3.79	5.48
C-137 -061	C-137 -060	9	50	0.00	0.56	5.66
C-137 -061	C-137 -060	10	25	0.09	0.12	5.63
C-137 -061	C-137 -060	11	10	0.00	0.08	5.59
C-137 -093	C-137 -092	1	1,250	1.10		5.75
C-137 -093	C-137 -092	2	1,000			
C-137 -093	C-137 -092	3	750	0.87		3.96

Station	CTD no.	Bottle no.	Bottle Depth (m)	PO_4 (µM)	Chl *a* (µg/l)	O_2 (ml/l)
C-137 -093	C-137 -092	4	500	0.15	0.00	3.27
C-137 -093	C-137 -092	5	400	0.25	0.00	4.77
C-137 -093	C-137 -092	6	300	0.09	0.00	4.67
C-137 -093	C-137 -092	7	200	0.01	0.06	4.91
C-137 -093	C-137 -092	8	100	0.00	0.38	
C-137 -093	C-137 -092	9	75	0.00	0.34	5.59
C-137 -093	C-137 -092	10	50	0.00	0.33	5.74
C-137 -093	C-137 -092	11	25	0.07	0.10	5.98
C-137 -093	C-137 -092	12	10	0.00	0.16	5.70
C-137 -100	C-137 -099	1	1,500	0.85		5.89
C-137 -100	C-137 -099	2	1,000	0.31		5.58
C-137 -100	C-137 -099	3	750	1.59		3.92
C-137 -100	C-137 -099	4	500	1.12		3.91
C-137 -100	C-137 -099	5	300	0.18	0.00	4.97
C-137 -100	C-137 -099	6	200	0.23	0.00	4.87
C-137 -100	C-137 -099	7	150	0.02	0.12	4.90
C-137 -100	C-137 -099	8	100	0.05	0.47	5.71
C-137 -100	C-137 -099	9	75	0.09	0.23	6.50
C-137 -100	C-137 -099	10	50	0.01	0.15	5.86
C-137 -100	C-137 -099	11	25	0.01	0.06	5.90
C-137 -100	C-137 -099	12	10			
C-137 -114	C-137 -112	1	1,000	1.06		3.87
C-137 -114	C-137 -112	2	750	1.33		2.61
C-137 -114	C-137 -112	3	500	1.44	0.00	2.14
C-137 -114	C-137 -112	4	400	1.11	0.01	1.93
C-137 -114	C-137 -112	5	300	1.04	0.00	2.03
C-137 -114	C-137 -112	6	200	0.54	0.00	3.54
C-137 -114	C-137 -112	7	150	0.35	0.02	2.77
C-137 -114	C-137 -112	8	100	0.09	0.18	3.54
C-137 -114	C-137 -112	9	75	0.00	0.32	4.84
C-137 -114	C-137 -112	10	50	10.00	0.08	3.75
C-137 -114	C-137 -112	11	25	0.00	0.09	3.58
C-137 -124	C-137 -123	1	401	1.46	0.00	3.42
C-137 -124	C-137 -123	2	400	1.23	0.00	3.76
C-137 -124	C-137 -123	3	300	1.37	0.00	3.76
C-137 -124	C-137 -123	4	200	0.16	0.00	4.40

Station	CTD no.	Bottle no.	Bottle Depth (m)	PO_4 (μM)	Chl *a* (μg/l)	O_2 (ml/l)
C-137 -124	C-137 -123	5	150	0.22	0.06	4.40
C-137 -124	C-137 -123	6	125	0.14	0.20	4.63
C-137 -124	C-137 -123	7	100	0.09	0.37	4.90
C-137 -124	C-137 -123	8	75	0.09	0.65	5.17
C-137 -124	C-137 -123	9	50	0.03	0.11	5.51
C-137 -124	C-137 -123	10	25	0.02	0.14	6.81
C-137 -124	C-137 -123	11	10	0.08	0.10	5.64

Most carousel casts deployed 11 Niskin bottles
Blank entries mean no data collected

Appendix F: Hourly Measurements

Figure 6. Surface Water Temperature

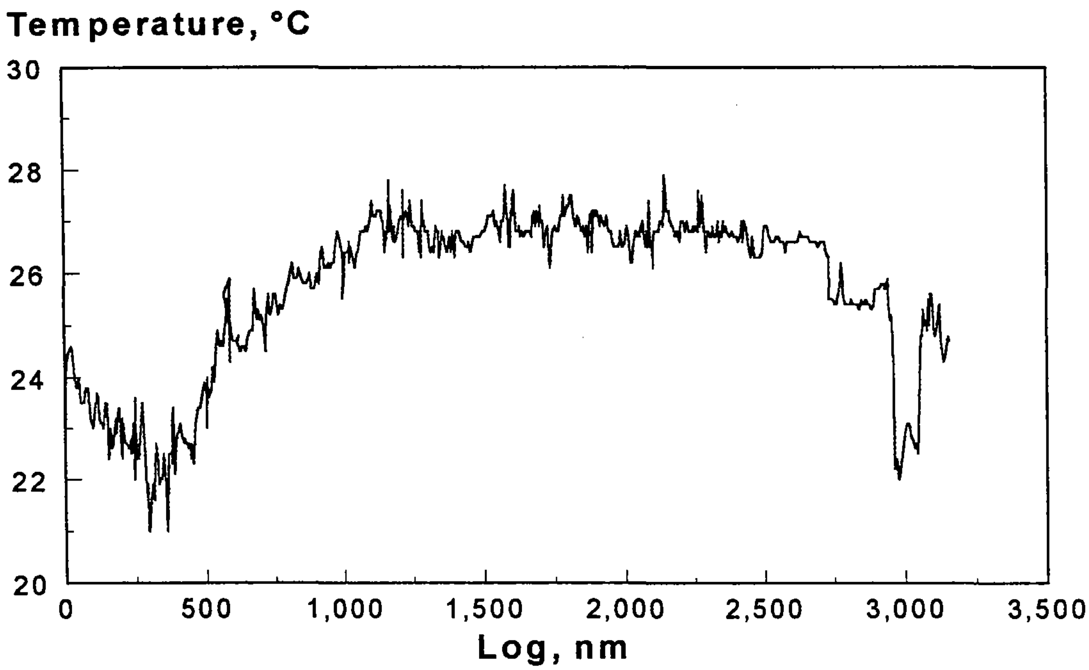
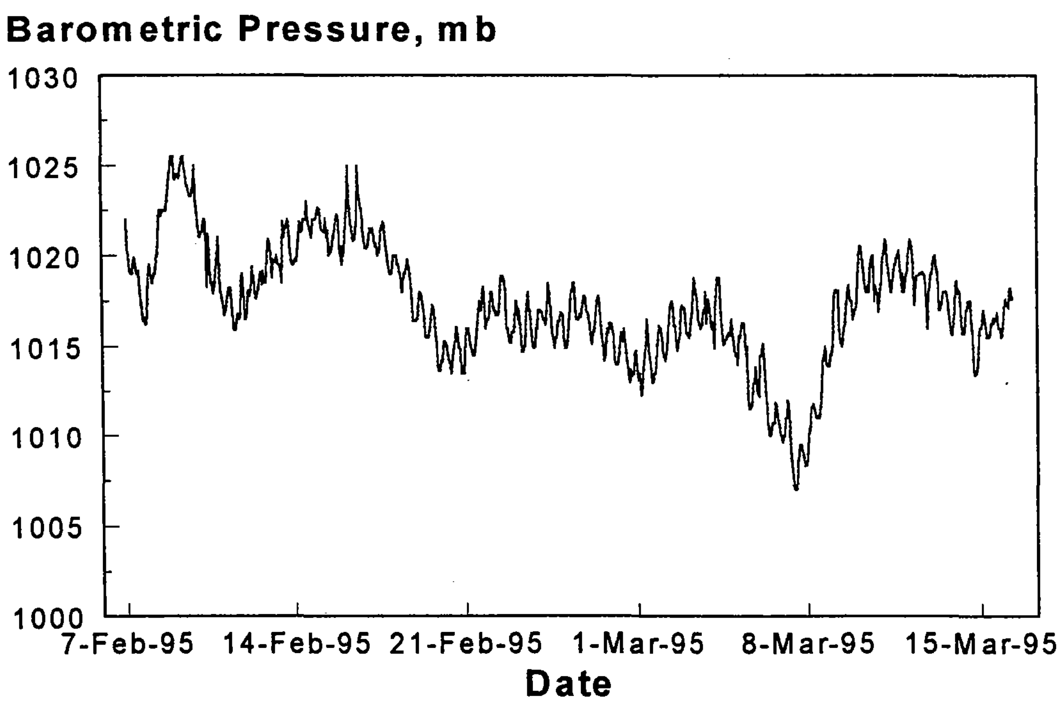


Figure 7. Barometric Pressure



Appendix G: CTD Sections

Figure 8. CTD Temperature Section, Miami – Little San Salvador

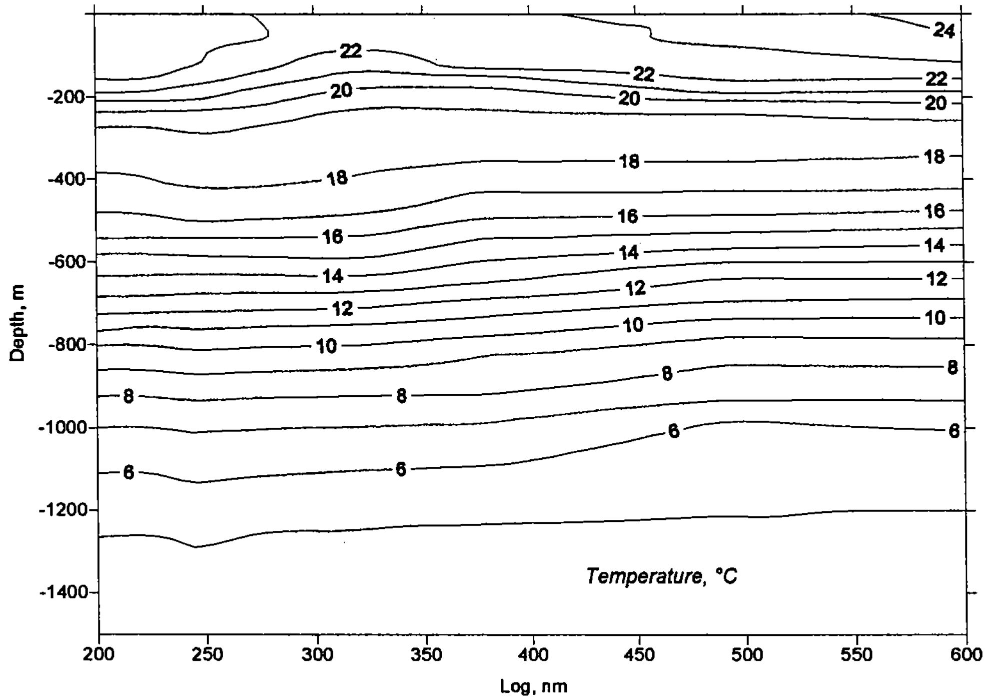


Figure 9. CTD Salinity Section, Miami – Little San Salvador

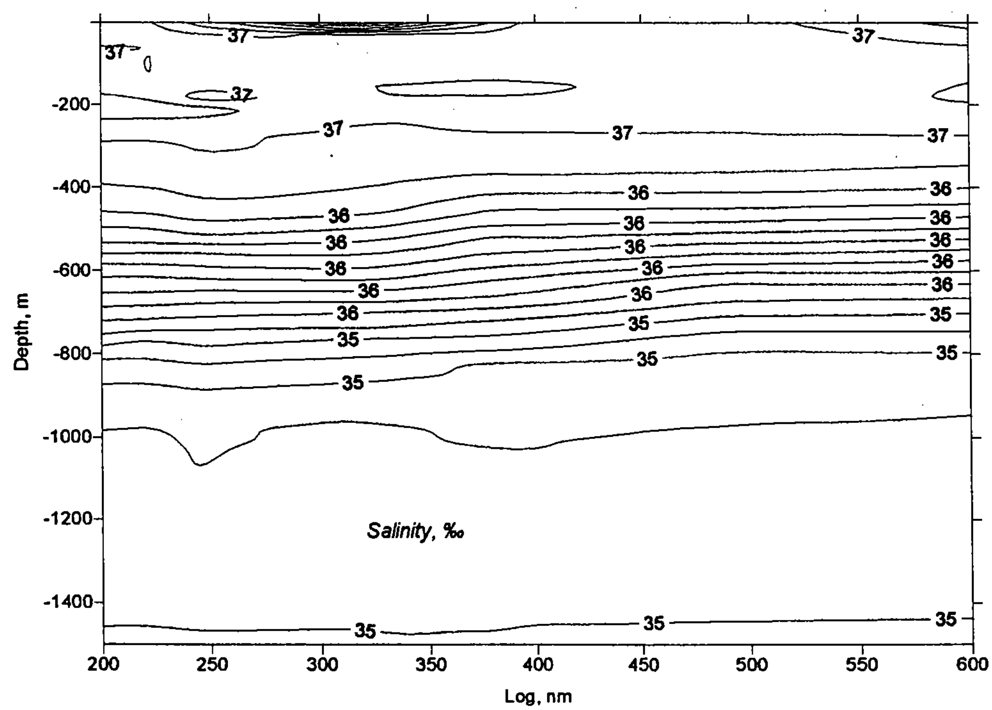


Figure 10. CTD Temperature Section, Little San Salvador – Jamaica

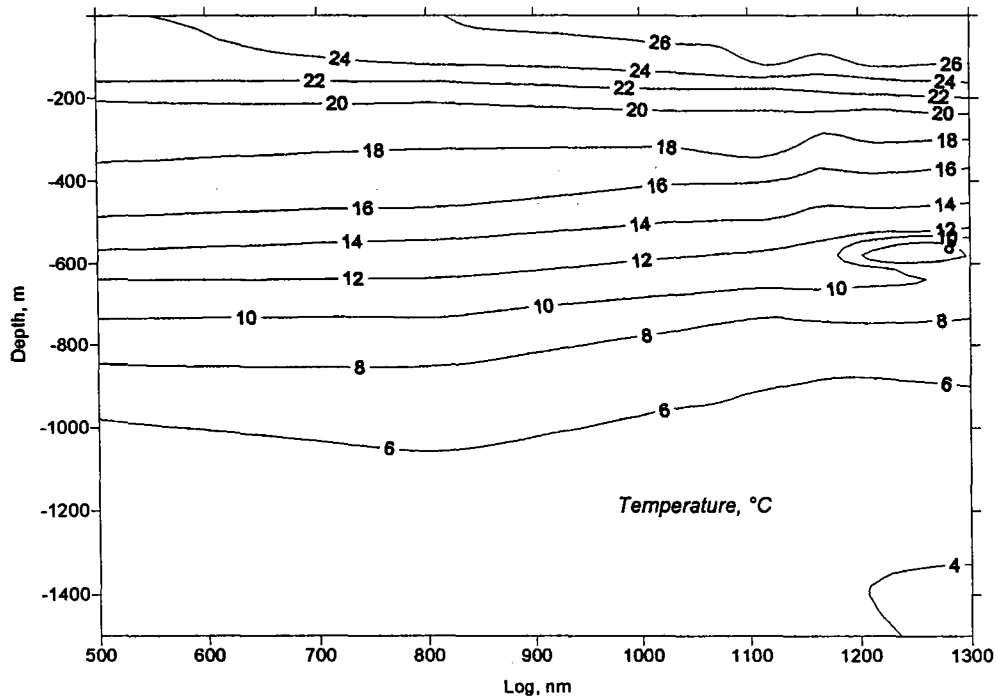


Figure 11. CTD Salinity Section, Little San Salvador – Jamaica

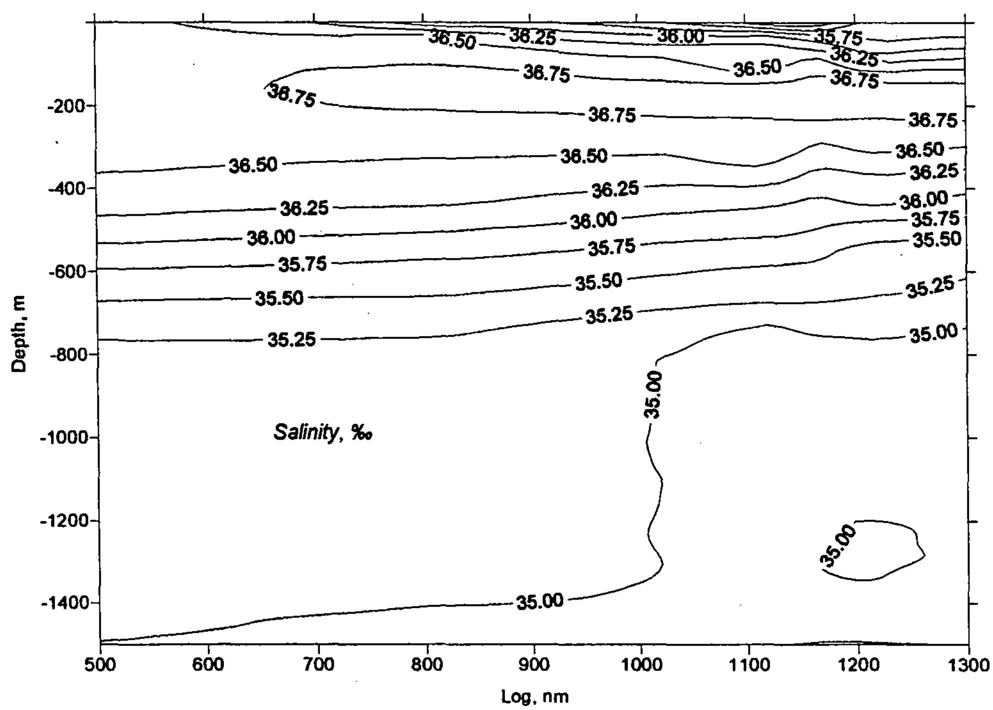


Figure 12. CTD Temperature Section, Jamaica – Roatan

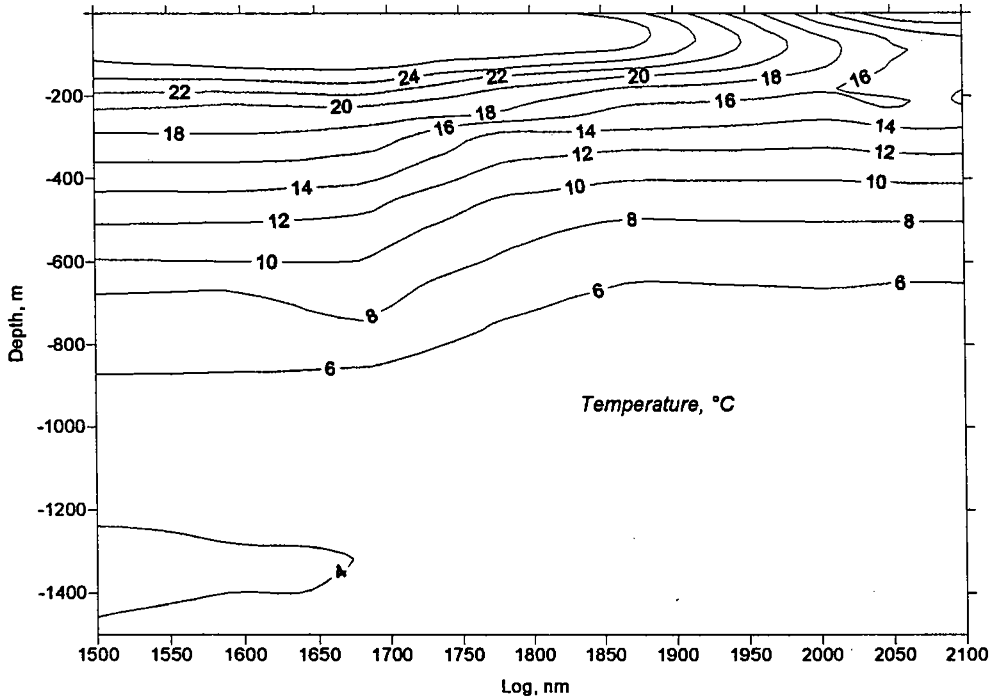


Figure 13. CTD Salinity Section, Jamaica – Roatan